Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-165-AC2, 2018


Hydrology and Earth System Sciences
Discussions
Open Access

# *Interactive comment on* "Multimodel assessment of climate change-induced hydrologic impacts for a Mediterranean catchment" *by* Enrica Perra et al.

**Enrica Perra et al.**

enrica_perra@hotmail.it

Received and published: 18 June 2018

We thank Reviewer 2 for her/his comments on our manuscript. In the following, the specific comments by Reviewer 2 are copied, followed by our replies to each point.

1) Introduction: while describing the state of the art, it would be appropriate, in addition to listing different sources of uncertainty, also highlight with appropriate bibliographic references that the uncertainty is greater in the climatic modeling of future scenarios rather than in hydrological models.

We have added a couple of references (Hawkins and Sutton, 2009; Pechlivanidis et al., 2017) in the second paragraph of the Introduction that address this point.

2) L.187: According to the sentence "those [models] exhibiting the best performance"



it may be useful to provide some further explanations about the criteria involving the choice of climate models.

When assessing a climate model's skills, it is important to examine its ability to reproduce the annual averages and seasonal variability of precipitation and surface temperature. This is stated in the revised manuscript as follows (lines 210-214): "Deidda et al. (2013) analyzed the open-access outputs of fourteen GCM-RCM combinations from the ENSEMBLES project to identify those exhibiting the best performance in terms of representing the intra-annual variability of precipitation and temperature in the present climate for the seven study sites of the precursor European project. For each study site, the selected set of climate model data was validated using the E-OBS dataset, a high quality pan-European gridded observational dataset of daily precipitation and temperature (Haylock et al., 2008)."

3) L.191: Although I am aware of the large amount of work done both in the calibration and validation of hydrological models and for what concerns the determination of the climatic scenarios, it is worth highlighting that the SRES scenarios used in the paper are now outdated and that perhaps it would have been more useful to refer to the new RCP scenarios. It would be appropriate to motivate this choice.

This study is based on data and model implementations that were part of a European-funded research project that ran from 2010 to 2013 (Ludwig et al., 2010, cited on line 93; see also the Acknowledgements for further details on this project). The new RCP scenarios were not available at the time of the project.

4) L.205: The authors use a bias coefficient "alpha" proposed by Duveiller et al. (2016), which is interesting from a statistical point of view, but in terms of graphic rendering it does not seem very readable, especially if the number of models is expected to increase. In this sense, Figures 5, 10 and 11 provide summary indications not allowing to appreciate differences, not necessarily macroscopic, between models. The use of tables could better integrate the information content of the aforesaid figures.

We have added, as supplementary material to the paper, four tables that provide the actual values of the Pearson and bias coefficients for the different analyses performed.

5) In the paper it would be useful a "Discussion" section dedicated to a detailed description of the causes of the main differences between the hydrological models, since they are only partially hinted at when results are introduced and at the end of Conclusions.

We have moved the discussion on the differences that emerge in the analysis of agreement from the last paragraph of the Conclusions to the last paragraph of Section 4.3 (Agreement analysis), and we have added an additional consideration to this discussion (lines 411-412).

6) It would also be useful to evaluate such differences among the models also in the light of their performances compared to the observed data, which is not evident in the manuscript.

See the next point.

7) To this end, at least it is necessary to recall in detail the results related to the performances of the single models, not only reporting citations (ll. 114-115), among which there is a manuscript in preparation.

We have added at the end of Section 3.1 more details on the single model performances against observed data during the calibration procedures (lines 192-208).

8) The Conclusions should be improved. For example, it is said (ll, 418-420) "CATHY, for instance, has the most detailed subsurface representation of the five models, and as such will tend to retain more water in subsurface storage, making some of this water available for subsequent evaporation". Is it possible to achieve a more general conclusion from this statement? Is it possible to state only that a more detailed model increases the subsurface storage or one can infer that a more detailed model is more credible and therefore the forecast of increased subsurface storage is to be considered more likely? The same is true for models with a more detailed description of vegetation.



This question can be answered only considering also the performances with respect to the observations (see previous point).

This is a holy grail question that is difficult to answer. As the reviewer points out, assessing the actual worth or correctness, even in likelihood terms, of the different models would require much more extensive comparison against observations. This was not the intent of our study, and indeed, as noted in the added section on the calibration procedures, two of the model parameterizations, CATHY's and TOPKAPI's, were in large part based directly on the tRIBS calibration results. Since we are dealing with hydrologic models that represent watershed processes at very different levels of detail, and since the best climate/hydrologic model coupling for our specific study site is not known a priori, our focus instead was on using a multimodel platform to provide a range of possible hydrologic responses for climate change scenarios, while at the same time quantifying in some way the level of interagreement between models based on these different responses.

---

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2018-165, 2018.